FEICA The European voice of the adhesive and sealant industry

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Adhesives in the regulation of end-of-life vehicles (ELVR)

In July 2023, the European Commission published a proposal for a regulation on *circularity requirements for vehicle design and end-of-life vehicles* ('ELV regulation proposal', document COM 2023/451, 'ELVR'). The proposal describes various measures to increase the circularity of vehicles, e.g., through *vehicle design* or through an *extended producer responsibility* (EPR) system.

Both in the requirements on vehicle design ('circularity strategy', Article 9 and Annex IV) as well as in the requirements on EPR ('fee modulation', Article 21), adhesives are mentioned explicitly as potential impediments to end-of-life-vehicle circularity, that shall be addressed in the vehicle design process and in the EPR fee setting. The text of the articles and the Annex imply that adhesives are *in* ***general*** a substantial challenge for the ***dismantling*** and for the ***recycling*** of end-of-life vehicles.

FEICA fully supports the EU's Circular Economy strategy and the goals of the ELVR, and indeed, many adhesives' applications have been allowing the successful dismantling of vehicles, including for repairs, for many years. The adhesive industry invests heavily in innovation to further improve the recycling of bonded parts, e.g., through 'debonding by design' and the use of adhesives that do not impact the quality of recycled materials. The explicit mentioning of adhesives as an arbitrary example for materials creates regulatory insecurity, risks damaging the reputation of proven technologies, and jeopardises investment into research and innovation. For this reason, the negative example should be removed.

To ensure that the adhesive industry can continue enabling innovative solutions for vehicles, *FEICA strongly insists:*

- ***Removing the negative example of adhesives*** *as a challenge for the dismantling and for the recycling of the end-of-life vehicles, both in the requirements on vehicle design ('circularity strategy', Article 9 and Annex IV) as well as in the requirements on EPR ('fee modulation', Article 21)*

Adhesives enabling repair, dismantling and recycling of vehicles

A typical mid-sized car contains less than 10 kg of adhesives in total, spread over numerous specialised applications and application-specific formulations. Although negligible in terms of mass, the positive contribution of adhesives to the sustainability and performance of vehicles is significant.

Adhesives in automotive applications

Adhesives play a critical role in the production and assembly of most vehicle components, including the body, windows, drivetrain (for both electric and internal combustion engine vehicles), suspension, trim and interior, and electrical systems, including the high voltage batteries in battery electric vehicles. Adhesives enable optimal bonding of parts, with a focus on performance, durability, longevity and crash safety. Additionally, adhesives are key to combining dissimilar materials, enabling light-weight designs such as mixed-metal vehicle bodies and the use of composite materials

as structural components. In electric vehicles, adhesives provide crucial bonding solutions for the battery systems. An extensive list of adhesive applications is provided at the end of this document.

Adhesives are not a marginal material but an enabling technology critical to modern vehicle design. The benefits of using adhesives in vehicle construction include enabling ***lightweight*** vehicles with lower energy consumption and emissions, increased ***safety*** and crash resistance, and improved longevity, ***durability*** and ***reusability*** of car parts.

The use of adhesives in modern vehicle production is essential, as they cannot be substituted without substantial negative consequences. As such, regulating or discouraging the use of adhesives in a generalised way, without a **detailed impact assessment**, can incur potentially severe negative consequences for vehicle safety and sustainability.

Adhesives in the dismantling of end-of-life vehicles

Adhesives have a long history in vehicle production and assembly and have, in many cases, been allowing the successful dismantling of vehicles, including for repairs. This is evidenced by the large market in Europe for used vehicle components, which have been secured by thread lockers, adhesive tapes, and other adhesive bonds during the vehicles' service life.

The ***mechanical separation*** of various adhesive bonds is well established and routinely practiced in repair jobs. For example, in windscreen replacement, this separation is performed by cutting the adhesive bond with a wire. We understand that the rationale for the blanket language in the Commission proposal may refer to legacy calculations from 2008 concerning windscreen removal time and costs in Germany. However, advances since then clearly demonstrate that glass can be efficiently removed and recycled in many EU countries. For example, GlassLoop – the windshield recycling project by Audi – shows how modern processes can achieve high-quality recycling outcomes.

Another example of common debonding are protective and decorative films on the bodies of vehicles which can be removed by hand after gentle heating, while aerodynamic and trim components are released by simple mechanical force—often faster than unscrewing or drilling out fasteners. Other examples exist and prove that adhesives generally do not introduce additional hurdles or steps in the dismantling of vehicles.

At the same time, ***not all adhesive bonds need to be dismantled*** for successful reuse or recycling. For example, structural adhesives applied between metal components or parts of the same metal family (e.g., structural adhesives and foams in the vehicle bodies, or seam sealers) generally do not need to be released, as the entire bonded component or part may be sent to metal recycling or preparation for metal recycling (see below).

Adhesive bonds *within* the vehicle components, such as textile and trim lamination, stickers and the adhesives within electrical and electronic components, are typically not targeted for further dismantling. In such cases, subsequent recovery and recycling processes for these components or parts may be set up to perform by separation of the adhesive bond, where required, as described in the following section.

Innovative adhesive concepts can also allow for ***debonding on command***, where the adhesive bond is specifically weakened through an external trigger, allowing for easy separation of the bonded surfaces[1] during repair and during preparation for reuse or recycling.

The use of adhesives in vehicles, therefore, **does not present a general impediment** to the dismantling of end-of-life vehicles or the removal and replacement of specific parts and components in vehicles.

Adhesives in the recycling of end-of-life vehicles and their parts

After refurbishment and remanufacturing, vehicle recycling is the most important strategy for a circular economy for vehicles. When the impact of adhesives on recycling operations is considered, two principal distinctions need to be made that relate to the materials being bonded:

- Whether the adhesive was used to bond similar or dissimilar materials together
- The nature of the target material for recycling, e.g., a certain metal, a certain plastic material, or glass

Where an adhesive bonds similar or identical materials together, the bond may not need to be released for recycling. For metals, adhesives are destroyed in steel melting or aluminium de-coating, meaning recycling rates remain high[2, 3]. The quality of recycled glass is also typically not substantially affected by adhesives[1, 4]. Similarly, adhesives can be designed to be ***compatible with recycling*** processes for plastic materials. This is an already widely followed approach in the design-for-recycling of plastic packaging materials that are produced using adhesives. In the vehicle sector, an example is the recycling of self-adhesive decorative vehicle wrapping films[5].

Where dissimilar non-metal materials are bonded by adhesives, separating the different materials may be required. The release of the adhesive bond typically occurs ***mechanically***, e.g., by manual release or shredding, followed by density-based separation, sensor-based sorting, or sieving to separate the released materials into two or more fractions. Separation of bonded materials depends on the specific combination of materials and adhesives and therefore requires specific consideration [1]. However, such cases are not representative of adhesives' applications in vehicles as a whole.

The use of adhesives in vehicles **does not present a general impediment** to the recycling of materials from end-of-life vehicles. The individual cases where a release of an adhesive bond is necessary for recycling require specific consideration **and cannot be successfully regulated in a generalised way**.

Proportionality considerations

The principle of proportionality, one of the general principles of EU law, requires that measures do not go beyond what is necessary to achieve their objectives. In applying this principle, the least burdensome option should be chosen, and any disadvantages caused must not be disproportionate to the aims pursued.

In the context of the ELV Regulation, the explicit references to adhesives appear not to be required for achieving its stated objective – "to facilitate the transition of the automotive sector to the circular economy, at all stages of the vehicle – from design to final treatment at end-of-life." Adhesives already include applications that are recycling-friendly and compatible with dismantling practices. As such, generalized references do not improve the Regulation's effectiveness but may create uncertainty and unintended consequences. It would therefore be more proportionate to omit such references and instead focus on measures that directly support circularity.

Conclusion

FEICA is convinced that **the explicit and generalised mention of adhesives as an impediment to dismantling and recycling in the ELV regulation proposal is inaccurate, as adhesives can allow for and even enable successful dismantling and recycling**. Generalized statements suggesting that all adhesives are problematic create a misleading perception of the industry, overlooking the fact that many adhesive applications are already compatible with established recycling processes. Such language can unintentionally undermine proven solutions and discourage innovation.

FEICA also believes that the current wording constitutes an uneven playing field, as other materials and bonding technologies that may affect dismantling and/or recycling are not mentioned. Therefore, FEICA strongly advises to **remove the mention of adhesives from the text of the ELV regulation proposal.**[1]

Examples of applications of adhesives in vehicles

Key adhesive applications in vehicles include:

- Adhesives for bonding different components of the body, including light-metal and composite components that reduce vehicle weight
- Adhesives for reinforcing lightweight metal body components and improving crash safety (e.g., in bumper beams, pillar reinforcement)
- Adhesives for bonding the windscreen onto the body as a structural element, increasing rigidity, reducing vehicle weight and improving safety
- Crash-proof bonding of the rear-view mirror to the windscreen
- Lamination of the surfaces of interior panelling, cladding, trim and dashboards, including lamination with safety-improving soft surface materials
- Adhesives for upholstery and other automotive textiles, and for the production of airbags
- Attachment of exterior functional elements with self-adhesive tapes, such as aerodynamic elements
- Thread lockers, retaining compounds and other adhesives that ensure reliability and ruggedness of vehicle components, especially in the drivetrain and the suspension
- Various adhesive applications in the production of electrical and electronic components
- Adhesives for the production, assembly and casing of high voltage electric batteries
- Self-adhesive protective and decorative films for vehicle bodies, preventing paint damage and reducing the need for repainting
- Various legally required stickers, such as type codes, airbag warnings, and fuel, charging and operating fluid type information

For **concrete examples** of specific applications of adhesives and their benefits, see [6–9].

References

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[2] Automotive, The Aluminum Association, https://www.aluminum.org/automotive (accessed 8 November 2023).
[3] Determination of Steel Recycling Rates in the United States.
[4] Onusseit H. The influence of adhesives on recycling. *Resources, Conservation and Recycling* 2006; 46: 168–181.
[5] PVC Automotive Products - Vinyl Council of Australia, https://www.vinyl.org.au/automotive (accessed 8 November 2023).

[1] Specifically, removal of 'such as adhesives' from Article(21)(e) of the proposal and 'for example adhesives' from Annex IV, Part A, Point 5(d), and from Annex IV, Part B, Point 3(c).

[6] Body Shop Adhesives Stronger Bonds Start with Sika, https://industry.sika.com/dms/getdocument.get/cf3b59aa-e0de-4756-9c8b-bd9f8627da15/body-shop-adhesives.pdf.
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About

FEICA is the Association of the European Adhesive & Sealant Industry. Adhesives and sealants (A&S) play a crucial role in many of the EU's strategic sectors and are essential enablers of countless everyday products. A&S enhance products' performance, durability and circularity. With the support of its members and national associations, FEICA voices the interests of the industry in Europe, where 85% of adhesive and sealant companies are SMEs. The association provides regulatory guidance, helps members navigate compliance requirements, and promotes sustainable practices. FEICA fosters collaboration with industry stakeholders to address shared challenges and to create a mutually beneficial economic and legislative environment.

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